(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
25 April 2002 (25.04.2002)

PCT

(10) International Publication Number
WO 02/33620 A1

(51) International Patent Classification[7]: G06F 17/60

(21) International Application Number: PCT/US01/29715

(22) International Filing Date:
24 September 2001 (24.09.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/690,122 16 October 2000 (16.10.2000) US

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(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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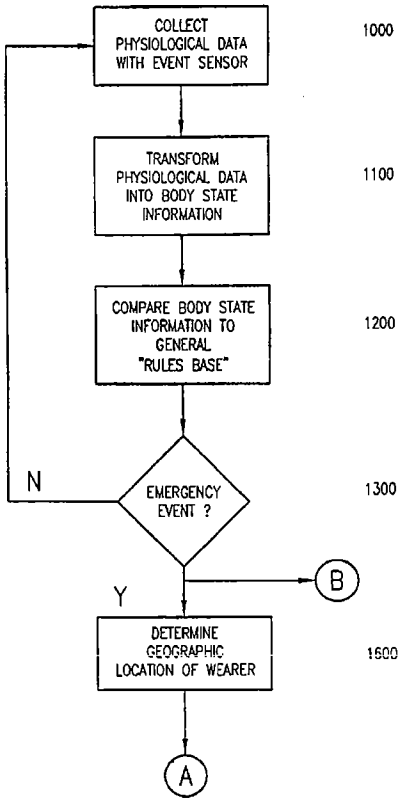
(54) Title: SYSTEM FOR PROVIDING PERSONAL SECURITY VIA EVENT DETECTION



(57) Abstract: An apparatus, method, and data structure for providing personal security are presented, including a sophisticated system of component technologies designed to provide automatic detection and communication of its wearer's distress to appropriate emergency help regardless of the user's location on Earth. Physiological data may be collected by an event sensor (1000). The physiological data may then be sent to a physiological feedback thread for transforming the data into body state information (1100). The body state information is then sent to a distress rules processing thread where the body state information may be compared to a general "rules base" to enable decision making about the physiological data (1200). If an emergency event is detected (1300), information concerning the type and severity of the event may be sent to a distress message management thread (1500).

WO 02/33620 A1

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

SYSTEM FOR PROVIDING PERSONAL SECURITY VIA EVENT DETECTION, FOR PROVIDING PERSONAL HEALTH MONITORING VIA CONTINUOUS, AUTOMATIC BIOMETRIC DATA MEASUREMENT, AND FOR BIOMETRIC DATA EXCHANGE AND REPORTING

BACKGROUND OF THE INVENTION

The invention relates in general to an apparatus, method, and data structure for providing personal security via event detection, including automatic generation of an emergency signal based on an emergency event. More particularly, the invention relates to an apparatus, method, and data structure for facilitating communications between an event-detecting device and an emergency services provider, and other various features. The invention also relates to an apparatus, method, and data structure for providing personal health monitoring via continuous, automatic measurement of biometric parameters, analysis of these parameters, and communication of the analyzed parameters to a healthcare provider. Finally, the invention relates to an apparatus, method, and data structure for biometric data aggregation, reporting, and delivery to healthcare industry companies.

A universal problem encountered by every individual on Earth at some point in his or her life is a personal distress situation. Personal distress situations can result from violent crimes, medical emergencies, or accidents—sport, automobile, work, etc. In many instances, there is no clear means of resolution for the victim—he or she is physically immobilized (such as with a heart attack) or circumstantially immobilized (such as with a robbery with a gun to the victim's head). Even if the victim has taken it upon him or herself to carry something for security purposes, e.g., cell phone, firearm, personal siren, the security product the victim has chosen is unlikely to be useful for the particular event. In these situations, help may never come, or it may

arrive too late. In the United States alone, over 1.5 million deaths occur every year resulting from the three aforementioned major categories of personal distress situations. It is believed that most of these deaths could have been prevented if appropriate help could have been summoned to the victim in a timely manner.

Numerous personal security aids are available, e.g., cell phones, guns, Mace, home security systems, bedside phone dialers, automobile assistance systems. However, without exception, each of the available products is limited by a common characteristic—the product does not provide automatic resolution in every situation. Many other limitations are inherent to the products depending on the type of product. For instance, a can of Mace may be a great way to stop a rapist in a parking lot, but it has no value to a heart attack victim in his office; a cell phone works well for calling an ambulance when a victim breaks a leg crossing an icy street in a city, but it probably cannot assist rescuers in locating a victim buried in an avalanche. Furthermore, each product differs in packaging, transportation medium, legality, and usefulness.

However, in general, each product is designed to resolve only a single type of unfavorable situation and is largely useless for other types. Moreover, each product has other inherent limitations posed by geography or sociopolitical factors. The following table characterizes the problems with the current solutions in three different types of unfavorable situations.

	Medical Emergency	*Violent Personal Crime*	*Accident*
Firearm	• No resolution.	• Does not call for help. • No idea of location. • Not automatic. • Requires expertise to operate effectively. • May escalate rather than resolve. • Does not convey anything about victim's condition.	• No resolution.
Chemical Spray	• No resolution.	• Does not call for help. • No idea of location. • Not automatic. • May escalate rather than resolve. • Does not convey anything about victim's condition.	• No resolution.
Cell Phone	• Does not work everywhere. • May not convey location. • Not automatic. • Does not convey anything about victim's condition.	• Does not work everywhere. • May not convey location. • Not automatic. • May escalate rather than resolve. • May be unsafe to use in this situation.	• Does not work everywhere. • May not convey location. • Not automatic. • Does not convey anything about victim's condition.
Home Security	• Only protects	• Only protects	• Only protects

	Medical Emergency	*Violent Personal Crime*	*Accident*
System	victim when victim is home.	victim when victim is home.	victim when victim is home.
Automobile Security System	• No resolution.	• Protects the car, not the victim. • Panic feature only alerts potential help within earshot. • No automatic resolution.	• No resolution.
Automobile Assistance System (e.g., OnStar)	• Only useful if victim is in the vehicle. • Does not work everywhere. • May not convey location. • Not automatic. • Does not convey anything about victim's condition.	• Does not work everywhere. • May not convey location. • Not automatic.	• Only useful if victim is in the vehicle. • Does not work everywhere. • May not convey location. • Not automatic. • Does not convey anything about victim's condition.
Child Screamer Device	• No resolution.	• Only works if child is still in range of parent's device.	• No resolution.

What is missing is a universally applicable personal security solution. Three important factors suggest that the time is right for such a universal security solution: (1) the maturation of the Baby Boomer generation in the United States and elsewhere and the physical insecurity that comes with aging; (2) the increasing susceptibility of global citizens to random violence and the public fear of experiencing such violence; and (3) the expanding interest in "image" sports and outdoor recreational activities like skiing, hiking, mountain climbing, and hang gliding.

The foregoing demonstrates that there is a need for an invention which is universally applicable in a variety of distinct personal distress situations.

Closely related to the problem of personal security is the problem of discontinuous health monitoring in those persons with chronic disease. Twenty-five percent of Earth's six billion human inhabitants will eventually be diagnosed with a chronic, life-shortening disease, such as diabetes mellitus (DM) or cardiovascular disease (CVD). The persons so diagnosed then begin a series of interactions with the healthcare community in an effort to manage the disease. Even in the most medically advanced societies and even for the most severe cases of the disease, these interactions with the healthcare community are, at best, limited, irregular, and infrequent. The most intensive care delivery scenarios—hospitalization ($1500/day), placement in a nursing home ($400/day), or visiting nurse services ($88/day)—are options that are only realistic for the most severely affected subjects. Cost, stigma, and limited freedom make the former care delivery approaches inaccessible and undesirable to the mainstream disease sufferer who is not incapacitated by the disease and who wants to continue living an active life. At this time, there exists nothing that closes the gap between intensive care scenarios and the other extreme—an occasional visit to the doctor's office. Consequently, a continuous view of the mainstream subject's health condition is simply not available, and continuous regulation of the condition by medical professionals is impossible. This leads to the unfortunate circumstance of advancement of the disease in the subject. Even if the subject and his or her physician take a responsible stance toward the application of a disease management strategy (diet, exercise, medication, etc.), the model of occasional, irregular interaction between subject and physician remains like flying an aircraft in the dark without instruments—the likelihood of a crash is enormous because the

pilot has no information about the position of the aircraft. Until the disease sufferer next "touches down" at the doctor's office, his or her "whereabouts" and "flight patterns" remain unknown.

Like the consumer, the healthcare community "flies blind" in treating the patient and understanding how treatments affect the average disease sufferer for a particular chronic disease. Attempts to refine disease management programs are limited by the quantity and sample frequency of the information collected, since information is only collected from the mainstream disease sufferer during the occasional doctor's office visit. Collecting the information on a more continuous basis is impossible. This produces scenarios where, for instance, the effectiveness of a particular medication in treating a chronic disease cannot be reliably ascertained beyond that accomplished through the original clinical trials.

Some notable facts that highlight the need for health monitoring follow:

- Healthcare in the U.S. is a $1 trillion business, 75% of which is attributable to chronic diseases, most notably cardiovascular disease.
- Unpaid home healthcare – such as that provided by a son or daughter – has an enormous financial impact on working professionals, personally costing them an average $659,000 in lost wages, Social Security, and pension contributions, time off, promotion passovers, or early retirements over their professional careers.
- The average acute cardiac event experienced by a person fortunate enough to reach an emergency department in time costs the healthcare system $10,000.
- Corporate America absorbs productivity losses upwards of $93 billion annually due to chronic diseases.

The sum of the health monitoring and personal security problems is that mainstream people with chronic diseases do not receive the type of continuous health monitoring they need to enable them to realize good health outcomes, resulting in shorter lives for them and greater costs

of treatment for the health management organizations that provide for their healthcare. At the same time, as their condition worsens over time to the point that they experience a personal distress event, they may not be able to summon qualified emergency assistance in time to make a difference and, even when summoned, the emergency responders may not be able to be effective or may even compound the situation through inappropriate treatment.

No single solution—technical or non-technical—exists today to solve these problems.

SUMMARY OF THE INVENTION

The invention satisfies the need and avoids the drawbacks of the prior art by providing an apparatus, method, and data structure for providing personal security via event detection or manual activation; an apparatus, method, and data structure for providing personal health monitoring between patients and doctors; and an apparatus, method, and data structure for the collection, aggregation, reporting, and delivery of biometric health data to health care companies. In one embodiment, personal security is provided by automatic generation of an emergency message in response to an emergency event. This emergency message may be then transmitted to an emergency services provider. In another embodiment, personal health monitoring is provided by continuous collection of physiological parameters and their subsequent transmittal to a medical professional. In yet another embodiment, business-to-business biometric data reporting is provided by computerized warehousing of continuously collected physiological parameters, the aggregation or de-individualization of the data, and the transmittal of such data to health care businesses either on-demand or upon agreed intervals.

According to one aspect of the invention, an apparatus and method capable of automatically sensing a user's distress and distress type, identifying the user's spatial location, and communicating with local emergency management services to summon help to the victim are set forth. The apparatus and method may include the structure for and steps of sensing an emergency event, detecting a geographic location of the emergency event, generating an emergency message based on the emergency event and the geographic location, communicating the emergency message directly to an emergency services provider or to an interim computer system which then transmits the message to an emergency services provider, and powering the requisite structures. The system may also contain the structure for and steps of providing a feedback signal to the user, allowing the user to manually generate an emergency message, and allowing transmission of the user's medical information, or any combination of these features. In addition, the emergency message and medical information may be generated in a variety of languages, and most preferably in the official language in the user's geographic location.

According to another aspect of the invention, an apparatus and method for continuously collecting physiological parameters from a person, transmitting these data to a remote Internet site, applying health analysis algorithms and rules, displaying the information, and delivering the information to the user's healthcare provider are set forth. The system may also provide the ability to generate a priority message to a user's health-care provider based on rules applied to data collected by the system. Further, the system may provide the ability to generate trend analysis for use by other parts of a health care delivery chain. The system may additionally provide access to a personalized health and personal security site on the Internet, which may rely on the user's data trend analysis to deliver content to the user of the user's selection. An

additional feature of the system is that it may provide electronic interfaces that allow physicians' networks and insurers to "stamp" the user's medical record information into a memory of the unit whenever the user has an interaction with a part of the health care delivery chain and for emergency personnel to retrieve this information using a video and/or audio output mechanism on the unit. This latter feature may extend to the capability to retrieve a detailed view of the user's medical record information from a remote Internet computer system through a microbrowser software system installed on the unit.

According to another aspect of the invention, an apparatus and method for populating a computerized data warehouse of continuously collected physiological parameters from users, the aggregation and de-individualization of the data in the warehouse into data marts, the application of reporting algorithms to the data, the generation of reports or views of the data, and the on-demand or scheduled delivery of the information to companies in the health care industry are set forth.

In another aspect of the invention, a system for providing personal security to an individual contains a computer-readable memory for storing data for access by an application program and includes a data structure stored in the computer-readable memory. The data structure may include information used by the application program and may contain an emergency event field having information associated with the presence or absence of an emergency event, a physiological feedback field, a distress rules processing field for processing the physiological feedback field, a geographic positioning field for identifying the location of the individual, and a distress message management field for generating an emergency message corresponding to an emergency event. The data structure may also contain a voice processing

field for converting the emergency message into a voice message, a power management field for controlling power to the system, a heat flash indicator field for providing a feedback signal to the individual, a networking field for downloading updated information from an external computer, and a configuration update field authenticating the updated information.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 illustrates a personal security system worn by an individual for a preferred embodiment of the invention.

Figure 1A illustrates another preferred embodiment of the personal security system shown in Figure 1.

Figure 1B illustrates a pager-like device of a preferred embodiment of the personal security system shown in Figures 1 and 1A.

Figures 2A and 2B illustrate a side view and a cutaway view of the preferred embodiment of the personal security system of the invention shown in Figure 1.

Figure 3 illustrates a schematic depiction of a preferred embodiment of the personal security system according to principles of the invention.

Figures 4A and 4B illustrate a flowchart of a preferred operation of the personal security system according to principles of the invention.

Figure 5 illustrates a personal security system for an alternative embodiment of the invention.

Figure 6 illustrates a detailed view of the wearable unit for the embodiment of the invention shown in Figure 5.

Figure 7 illustrates a detailed view of the computer unit for the embodiment of the invention shown in Figure 5.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 depicts a system 10 for providing personal security to a user via event detection, according to one aspect of the invention. In this preferred embodiment, the system 10 is included in a wearable anklet device 20 and is worn at or near the ankle of the wearer. The system 10 may also be worn at or near the wrist of the wearer or at any other location on the body in which the system 10 contacts the skin of the wearer.

The system 10 need not be located within a single unit as it may be distributed among two or more structures. For example, as shown in Figure 1A, the system 10 may be located within two pieces: a sensory device 20A, which may be either a non-invasive device worn on the wrist, ankle, chest, or any other suitable location on the body in which contact with the skin of the wearer may be made or an invasive, injectable or implantable device, and a pager-like unit 20B, which may be worn on the belt or any other suitable location on or near the body or woven into or clipped onto an article of clothing. Preferably the pager-like unit 20B will contain the majority of electronics and logic of the system 10 (described below), a power supply (not shown) and a short-range radio-frequency transceiver 20D, while the sensory device 20A includes one or more sensors (described below), a power supply (not shown), and a short-range radio-frequency transceiver 20C. Preferably, the short-range radio-frequency transceivers 20C, 20D will comply with the Bluetooth specification; however, these devices may be of any suitable type. The distribution of components between the sensory device 20A and the pager-like unit 20B may be

of any arrangement which allows suitable performance of the system according to the principles of the invention and is not limited to the described distribution of components. In addition, the sensory device 20A may be in the form of a ring, finger sleeve, or a patch worn on the forehead or any other suitable location on the body.

As shown in Figure 1B, the pager-like unit 20B may include a back-lit liquid-crystal-diode display screen 20E and a button 20F, which, when depressed, will display the user's time-stamped, key medical-record information. As described below, this medical record information may include currently prescribed medication, past major medical events, drug and other allergies, and medical ailments; however, the medical record information that may be displayed in the display screen 20E is not limited to the specific medical categories described and may include other pertinent non-medical data as well. As discussed below, the display screen 20E may show information provided to the pager-like unit 20B by a remote data base (not shown), such as an Internet site. The pager-like unit 20B may also include a connectivity indicator symbol 20G which indicates the operational status of the system 10, such as whether the system 10 is operating correctly or the system is connected to an external communication link. The indicator symbol 20G may be any suitable type of light device, or the indicator may be displayed on part of the display screen 20E.

It is to be understood that the description of the system 10 that follows is not limited to a single device such as wearable anklet device 20; the system 10 may also be applied to a two-piece device, such as that shown in Figure 1A, or any other suitable multi-part device. Figures 2A and 2B depict the system 10 in a side view and a cutaway view, respectively, for the wearable anklet device 20 shown in Figure 1. As seen in Figure 3, the system 10 includes an external

component level 100, an internal component level 200, a system bus 300, and a software component level 400. The external component level 100 is preferably embedded into the surface of the wearable anklet device 20. The wearable anklet device 20, the sensory device 20A, the pager-like device 20B, or other such device may be weatherproof, shockproof, and "bodyproof," i.e., impervious to water, sweat, body heat, and physical punishment. In addition, it is understood that the distribution of the external component level 100, the internal component level 200, the system bus 300, the software component level 400, and the specific elements described below which are included within these components may be distributed in any suitable manner between the sensory device 20A and the pager-like device 20B in the embodiment shown in Figure 1A or in any suitable manner among the components of a device having two or more structures.

The external component level 100 may include an event sensor 110 for sensing a physiological event from the wearer. Preferably, the event sensor 110 is an electrogalvanic skin response sensor such as the MindDrive manufactured by The Other 90%, Inc. Electrogalvanic skin sensors use a technique called galvanic skin response (GSR); this technique measures the conductivity and electrical activity of the skin in order to sense physiological events. The MindDrive technology is capable of distinguishing between physiological signals generated by thoughts and signals generated by the autonomic nervous system. Although the preferred embodiment incorporates GSR, the event sensor 110 may be of any type that senses a physiological event—such as a pulse oximeter, electrical pulse meter, or blood chemistry detector—generated by the wearer. The physiological data measured by the sensor 110 are not limited to GSR measurements and may also include non-invasive or invasive pulse oximetry,

electrical pulse, and blood-chemistry measurements, or any other pertinent physiological data collected by invasive or non-invasive measurements which are sufficient to enable a medical professional to monitor a broad range of conditions, including, but not limited to, cardiovascular disease or diabetes mellitus. In one preferred embodiment, an injectable chip is inserted into a patient and is employed to collect blood-chemistry data according to the principles of the invention. One useful injectable chip is made by Sensors for Medical Systems (SFMS). The external component level 100 may also contain a manual entry input device 120, a feedback stimulator 130, and an input/output (I/O) port 140. In a preferred embodiment, the manual entry device 120 is a four-button, full logic keystrip allowing entry and interpretation of two different code sequences: one for manual initiation of a distress resolution process and one for canceling a distress resolution already in progress. The manual entry input device 120 may also be of any other type that allows manual initiation and cancellation of distress resolution processes. In a preferred embodiment, the feedback stimulator 130 generates a heat flash to notify the wearer that an emergency event has been sensed by the system 10. The feedback stimulator 130 may, however, be any suitable device that notifies the wearer that notification of an emergency event has been received by an emergency management service (EMS) including, but not limited to, visual, audio, and aromatic indicators. These indicators may be activated in a predetermined sequence and may be deactivated automatically or manually. In a preferred embodiment, the I/O port 140 is an infrared device used to communicate with an external computer (not shown) in order to download a combination of data pertinent to the wearer and may include medical, behavioral, and physical data; however, the I/O port may be of any type that enables such communication.

The internal component level 200 may include a power generator 210 and an energy storage device 220 for generating and storing the energy used by the system, respectively. Preferably, the power generator 210 is a kinetic power supply such as the Seiko Kinetic power subsystem; however, any suitable power supply may be used. Preferably, the energy storage device 220 is a type of capacitive storage; however, any suitable energy storage device may be used. In one aspect, a long-life battery (not shown) may be used in place of the combination of the power generator 210 and energy storage device 220.

The internal component level 200 may also include a geographical positioning system antenna 230, a geographical positioning system device 240, a wireless communication transceiver device 250, a wireless communication transceiver antenna 260, and a voice synthesizer device 270. In one embodiment, the geographical positioning system device 240 is a Global Positioning System (GPS) chipset, such as the SiRF Star i/LX RF and DSP GPS chipsets; however, any suitable geographical positioning system may be used. Preferably, the wireless communication transceiver device 250 is a combination satellite and cellular communicator; however, any suitable transceiver device may be used such as a satellite-only system, a cellular system (such as a code-division multiple-access system or any other suitable cellular system), or any other suitable communication system or combination of communication systems. The voice synthesizer device 270 may be an analog-to-digital—digital-to-analog chipset such as that commonly used in an interactive voice response system (IVR); however, any suitable synthesizer device may be used to generate voice signal. Antennas used for the geographical positioning system antenna 230 and the wireless communication transceiver antenna 260 are well known in the art. The wearer's body could also serve as the antenna for communicating via the

geographical positioning system device 240 and the wireless communication system device 250. In addition, the geographical positioning system device 240 may be augmented by an inertial navigation system (not shown) such as that manufactured by Point Research.

In a preferred embodiment, the system bus 300 is a printed circuit board as is well known in the art. The system bus 300 is used for communication between the external component level 100 and the software component level 400 and between the internal component level 200 and the software component level 100.

The software component level 400 may include a central processing unit (CPU) 410, a read-only memory (ROM) 420, and a random-access memory (RAM) 440. The CPU 410 may be an Intel StrongARM, a Motorola ColdFire, or an ARM, Ltd's ARM7 processor; however, any suitable processor may be used. The ROM 420 and RAM 440 may be of any known type.

As depicted in Figure 3, a real-time operating system (RTOS) 450 and an application process component 460 may be running in the CPU 410 and utilizing the ROM 420 and RAM 440. The RTOS 450 is preferably an embedded Java Virtual Machine (JVM), such as the VxWorks made by WindRiver Systems; however, any suitable software operating system may be used.

In a preferred embodiment, the application process component 460 has several functions or "threads": a power management thread 461, a physiological feedback thread 462, a distress rules processing thread 463, a geographic location input handling thread 464, a distress message management thread 466, a heat flash indicator thread 467, a networking thread 468, and a configuration update thread 469.

In operation, the "bodyproof" anklet device 20 in which the system 10 is located is worn by a user. In order to operate the system 10, the components in the system 10 may receive energy from the energy storage device 220, which in turn may be powered by the power generator 210. For example, the power generator 210 may generate power from the motion of the wearer much like a self-winding watch is powered. The metering of energy to the system may be controlled by the power management thread 461.

Figures 4A and 4B illustrate one aspect of the operation of the system in the presence of a detected event. Physiological data may be collected by the event sensor 110, as seen at step 1000. These physiological data may then be sent to the physiological feedback thread 462 for transforming the data into body state information, as seen at step 1100. The body state information may then be sent to the distress rules processing thread 463, as seen at step 1200; at this step, the body state information may be compared to a general "rules base" to enable decision making about the physiological data. For example, the system 10 may distinguish between the wearer experiencing a heart attack (i.e., the wearer's heartbeat has stopped) and the wearer experiencing an accident or a crime (i.e., the wearer's heartbeat has spiked). If an emergency event is detected, as seen at step 1300, information concerning the type and severity of the event may be sent to the distress message management thread, as seen at step 1500.

Information may also be sent to the geographic location input handling thread 464 concerning the existence of an emergency event by activating the geographic positioning system device 240 and the geographic positioning system antenna 230, as seen at step 1600. When the geographic location input handling thread 464 receives the geographic location of the wearer from the geographic positioning system device 240, a country/region lookup table may be

accessed to determine what country or part of a country the wearer is located, as seen at step 1700. Once the geographic location of the wearer is determined, the geographic location handling thread 464 may determine an official or local language spoken in the geographic location, as seen at step 1800. Next, the geographic location handling thread 464 may send the geographic location of the wearer and the official or local language of that geographic location to the distress message management thread 465.

Once the distress message management thread 465 has received the type and severity of the event from the distress rules processing thread 463, these data may be converted into a plain language sentence, as seen at step 1900. The plain language sentence may then be sent to the voice processing thread 466 where it may be converted into a synthesized voice message using the voice synthesizer device 270 in the official or local language, as seen at step 2000. Based on the determination of the country/region, as seen at step 1700, a contact number for the local EMS is determined at step 2100. The contact number and the synthesized voice message may then be sent back to the distress message management thread 465 and then on to the wireless communication transceiver device 250 and the wireless communication transceiver antenna 260, as seen at step 2200. Of course, the plain language sentence may initially be created in the proper language.

When the synthesized voice message has been created, the system 10 may contact the local EMS at the appropriate contact number. When the EMS answers the call, the system 10 may begin speaking to a dispatcher at the EMS using a series of prompts and recognition of the dispatcher's speech in the manner of an interactive voice response system (IVR).

The wireless communication transceiver device 260 may then send a notification to the distress message management thread 465 indicating that the EMS has received the synthesized voice message, as seen at step 2300. Once the EMS has received notice of the emergency event, the distress message management thread 465 may then send a notification to the heat flash indicator thread 467 which may then send a signal to the feedback stimulator 130, as seen at step 2500. As discussed above, the feedback stimulator 130 may indicate to the wearer via audio, visual, aromatic, or other indicators that the local EMS has been notified of the emergency event.

The system 10 will preferably come equipped with a default number of language sets and emergency numbers built in when purchased. The wearer may be able to configure the system 10 with a particular set (e.g., five) of languages and regions of travel (to which the emergency numbers would correspond) upon purchase. While the system 10 is worn, should the wearer pass from one language area to another, as detected by the geographical positioning system transceiver and antenna 240, 230, the proper language may be unloaded from the ROM 420 of the system 10. Simultaneously, the system 10 may connect via the Internet (by TCP/IP, for example) to a web server and download the language set and emergency numbers for the correct regional language. This connection via the Internet, of course, would not be necessary if the wearer moves to a new area whose language and emergency numbers are already loaded into the system 10.

The system 10 may also operate in a manual mode. In this mode, the wearer may depress a sequence of buttons on the manual entry device 120 indicating that the wearer is experiencing or observing an emergency event. In this situation, data from the manual entry device 120 may be sent directly to the distress rules processing thread 463, and processing may then proceed as discussed above beginning with step 1200.

In addition, the manual entry device 120 may be used to cancel the processing of an emergency event detected automatically or entered manually.

The system 10 may be used to hold a combination of data pertinent to the wearer and may include medical, behavioral, and physical data. These data may be downloaded into the system 10 upon the initial configuration of the system 10 or at any necessary time thereafter. These data may be loaded by connecting the I/O port 140 of the system 10 to an external computer database (not shown). The networking thread 468 may then be used to download medical data specific to the wearer from the external database to the system 10. Once the data are downloaded, they may be sent to the configuration update thread 469 to authenticate the data and apply the updates to the ROM 420 of the system 10. In one embodiment of the invention, these wearer-specific data may be transmitted to the EMS along with the transmission of emergency event information, as discussed above. These wearer-specific data may be converted to a plain language sentence and then to a synthesized voice signal in the proper language (these steps are not shown)—as was done with the emergency event data as shown in steps 1900 and 2000—or may be created directly in the proper language. Examples of wearer-specific data may be a type of medication taken by the wearer, an illness or condition the wearer has, or other such information that would be relevant to an emergency care provider. An important example of wearer-specific data that could be sent to the EMS would be a list of drugs to which the wearer is allergic.

The system 10 may also transmit data pertinent to the wearer that may be stored in the ROM 420 and transmitted through the I/O port 140 to a local reader device (not shown), such as a handheld display terminal carried by an on-site emergency medical technician (EMT). As contemplated by the invention, this type of data transmission is a direct transmission type. This

functionality may allow medical data specific to the wearer to be transmitted directly in a local manner in lieu of continued communication with the EMS, with the EMS then communicating with the on-site EMT. Access to this function may be controlled by a security algorithm that may be supplied by entering a code through the keystrip or through the EMT's local reader device. The code is preferably a one-time-use code generated by the system 10 and transmitted to the EMS dispatcher, and then provided to the EMT upon dispatch. Alternatively, the system 10 may display data pertinent to the wearer on the liquid-crystal-diode display screen 20E of the pager-like unit 20B in order that the wearer or the EMT may directly observe the wearer's data from the system 10. In yet another alternative embodiment, the system 10 may audibly communicate data pertinent to the wearer using the speech synthesizing component of the pager-like unit 20B in order that the wearer or the EMT may directly hear the wearer's data from the system 10.

In an alternative embodiment, the code may be transmitted directly to the display terminal carried by the EMT if the EMT is called to the location of the wearer of the system 10 via another method than the system's 10 built-in communication components. For example, if the EMT witnesses an accident, the EMT may wish to collect information from the system 10 without receiving information from the EMS. In this scenario, it would not be necessary for the system 10 to communicate with the EMS because the EMT would be on the scene. In this alternative embodiment, the system 10 may transmit data through the I/O port 140 or may display data pertinent to the wearer on the liquid-crystal-diode display screen 20E of the pager-like unit 20B in order that the wearer or the EMT may directly observe the wearer's data from the system.

As seen in Figure 3, the system 10 may also have a long-term-storage device 430 that operates in a manner which is similar to a "black box" on an aircraft. In a preferred embodiment,

the long-term-storage device 430 is of the flash-memory type. The long-term-storage device 430 may record an audio or other type of communication between the system 10 and the EMS and may be protected to ensure that it is not written over. The long-term-storage device 430 may be adapted such that the audio or other type of communication may be accessed only through a special reader device (not shown), which may communicate with the system 10 through the I/O port 140. The special reader device may be held by the EMS or any other entity authorized to access data from the above-referenced block of memory. Preferably the special reader device would use a unique master security identification code to access the long-term-storage device 430 storing the recorded audio or other type of communication. Once the emergency event is over, the system 10 may call the EMS or any other authorized entity and copy the recorded audio or other type of communication to a central computer (not shown), using the same protocol as that for downloading a new language or other configuration information into the system 10. In the event a subsequent emergency event occurs and sufficient memory is not available in the long-term-storage device 430, the system 10 may overwrite the previous audio or other type of communication and record the current audio or other type of communication. It should be noted that the long-term-storage device 430 is not limited to storing audio or other type of communication between the system 10 and the EMS; the long-term-storage device may also record "raw" physiological data at pre-defined intervals or any other type of suitable recording of data according to the principles of the invention.

In another alternative embodiment, the system 10 may communicate directly with a personalized health and personal security Internet site (not shown). This communication mode may take place alone or in addition to the communication mode with the EMS described above.

In this embodiment, emergency event or other data may be sent directly to the personalized health and personal security Internet site, which, in turn, may generate alerts to the user's health-care provider based on appropriate algorithms in the biometric engine on the host Internet site's computers or any other computer to which the host Internet site is connected. The biometric engine may be capable of providing trend analysis of emergency event data or other data collected by the system 10 from the user. The biometric engine may, in turn, generate content to be delivered to the user.

The personalized health and personal security Internet site may generate and transmit data pertinent to the user, including medical, behavioral, or other data, to the system 10. These data may include "stamps" indicating that the user has had an interaction with a part of the health care delivery chain. These data may be processed through the networking thread 468 and the configuration thread 469 in order to update the ROM 140 of the system 10. These data stored in the ROM 140 of the system 10 may then be used as part of the data transmitted as part of an emergency event message. In addition, in a two-part system such as that shown in Figures 1A and 1B, these data may be displayed on the display screen 20E of the pager-like device 20B by pressing button 20G.

Physiological data may be collected in long-term-storage device 430. After the system 10 is connected to the personalized health and personal security Internet site, the emergency event data may be uploaded to the host Internet site. After uploading the emergency event data to the host Internet site, the memory of the long-term-storage device may be purged in full or in part in order to continue collection of physiological data.

In a further alternative embodiment, as shown in Figure 5, a health monitoring system 3010 for providing personal security services is illustrated as having three major components: a wearable unit 3020, which may be worn by a subscriber, a global communications network 3030, and a computer system 3040. As depicted, the wearable unit 3020 communicates with the computer system 3040 via the via the global communications network 3030. The wearable unit 3020 may be divided into two or more structures, and as shown in Figure 6, wearable unit 3020 is separated as a communication component 3022 and a sensor component 3027.

The communication component 3022 preferably contains similar communications elements as described above in connection with the embodiment associated with Figure 3, namely a geographical positioning system antenna 3230, a geographical positioning system device 3240, a wireless communication transceiver device 3250, and a wireless communication transceiver antenna 3260. A preferred geographical position system device 3240 may be similar to that described in connection with the geographical positioning system device 240; however, any suitable geographical positioning system device may be employed. In a preferred embodiment, wireless communication transceiver device 3250 is the same as wireless communication transceiver device 250; however, any suitable wireless communication transceiver device may be used.

In addition, the communication component 3022 may be equipped with similar external features as the pager-like unit 20B described above, namely, a short-range transceiver 3022A, a back-lit liquid-crystal-diode-display screen 3022E, a button 3022F, which, when depressed, will display the subscriber's time-stamped, key medical-record information, and a connectivity indicator symbol 3022G which indicates the operational status of the wearable unit 3020. The

type of information that may be displayed on the back-lit liquid-crystal-diode-display screen 3022E is similar to that described above for the pager-like unit 20B. In addition to the software and hardware described herein, the communication component 3022 may also be equipped with software to enable communication via wireless access protocol (WAP) with an emergency services system. Also, the communication component 3022 may have a button or sequence of buttons that allows a subscriber to generate an emergency message to be transmitted to the computer system 3040 via the communication network 3030.

The sensor component 3027 may be worn by a subscriber and may be a similar type of element as that described for the embodiment employing the event sensor 110 as discussed above in connection with Figure 3. The sensor component 3027 may also have a short-range transceiver 3027A in order to communicate with the shore-range transceiver 3022A located in the communication component 3022. As with event sensor 110, sensor component 3027 may measure GSR data, non-invasive pulse oximetry and blood-chemistry measurements, and any other pertinent physiological data collected by invasive or non-invasive measurements which are sufficient to enable a medical professional to monitor a broad range of conditions, including, but not limited to, cardiovascular disease or diabetes mellitus. One preferred sensor component 3027, an injectable chip, is described above. In addition, the sensor component 3027 and the communication component 3022 may each be equipped with short-range radio transceivers 3027A, 3022A in order for the sensor component 3027 and the communication component 3022 to communicate with each other. Preferably, the short-range radio transceivers are of a type made by Bluetooth; however, any suitable transceivers may be used.

The global communication network 3030 may be a satellite system, a cellular system, or a combination of these or other suitable systems. In a preferred embodiment, the cellular system is a CDMA system, a point-to-point system, or a specialized mobile radio system; however, any suitable cellular system may be employed.

The computer system 3040, shown in Figure 7, communicates with the wearable unit 3020 via the global communication network 3030 and may communicate with other computer systems via a variety of known communication links. The computer system 3040 preferably is an Internet-based system; however, any suitable computing system may be used. As seen in Figure 7, the computer system 3040 may have several component modules: a configuration engine 3050, a content management system 3060, a health monitor data engine 3070, a business-to-business (B2B) interface manager 3080, an event history system 3090, a distress event engine 3100, a customer records management (CRM) system 3110, an electronic store (e-store) 3120, and a knowledge management system 3130. It is to be understood that the computer system 3040 may be built from one or more individual computers with the individual computers connected by one or more of a variety of known links, including Internet-based connections.

The configuration engine 3050 may serve several functions. One may be to provide a location for subscribers of the personal security services to sign up for the service via an Internet or other suitable link. The configuration engine 3050 may also serve as the repository for medical information provided by a subscriber or one or more of that subscriber's health-care providers. The configuration engine 3050 may also serve to record changes or updates to a subscriber's records.

The content management system 3060 may allow a subscriber to select various news stories related to that subscriber's interests or medical condition via a rich-content delivery platform. The content management system 3060 may allow a subscriber to personalize the content and to change what content is seen when that subscriber logs into the Internet site provided to that subscriber via the personal security services. One preferable content management system is of the type manufactured by Vignette; however, any suitable content management system may be used.

The health monitor data engine 3070 may contain a collection of biometric data, i.e., physiological data that have been analyzed for a subscriber and stored as sequential records. In another embodiment, the health monitor data engine 3070 may collect data from a single subscriber or from various subscribers to create views of trends or summaries of medical information; by employing aggregate mathematical functions, which are sometimes referred to as "data marts." One type of data mart may show how an individual subscriber responds to a particular type of medical treatment, in a continuous or nearly continuous manner. Another type of data mart may provide aggregate information to a doctor or pharmaceutical company regarding a group of subscribers with respect to a particular treatment or drug. The data marts that may be employed in conjunction with the health monitor data engine 3070 are preferably designed to handle multi-dimensional ad hoc queries, e.g., the compliance level with the course of treatment for all males with a right-ventricular arrhythmia.

The B2B interface manager 3080 may communicate with health-maintenance organizations (HMOs). The B2B interface manager may serve to adjust data formats for various target systems.

The event history system 3090 may store records of communications between the wearable unit 3020 and an EMS. In addition, the event history system 3090 may also record various alerts generated by the health monitoring system 3010, and may page a physician or other health personnel when a subscriber is experiencing a distress event. In one preferred embodiment, the event history system 3090 uses an Oracle database; however, any suitable database system may be used.

According to the principles of the invention, the distress event engine 3100 may receive a distress signal from the wearable unit 3020 via transmission of an emergency data packet. The emergency data packet from the wearable unit 3020 may contain GPS data or data provided by an inertial navigation system. The distress event engine 3100 may map the GPS data provided by the wearable unit 3020 coordinates, which then may be used to determine the actual location of the subscriber, which may be defined in degrees of longitude and latitude or any other suitable metric. Preferably, the mapping of the GPS data is done by a system manufactured by Navtech; however, any suitable system for mapping the GPS data may be used. The distress event engine 3100 may then contact the appropriate EMS by way of searching a database of public service answering points (PSAPs) maintained by the distress event engine 3100. The distress event engine 3100 may then generate synthesized speech in the proper language in order to communicate with the EMS. Preferably, the speech processing system is one manufactured by Lernout & Hauspie; however, any suitable speech processing system may be used. Finally, the distress event engine 3100 may send an event notification message back to the wearable unit 3020 via the communication network 3030.

The CRM system 3110 may be used to manage individual subscriber accounts and may serve as the customer service link to the health monitoring system 3010.

The e-store 3120 may have a link to the CRM system 3110 and may serve as the standard "shopping cart" for subscribers to the personal security system. In addition, the e-store 3120 may have links to other Internet sites which may be of interest to the subscribers.

The knowledge management system 3130 may store subscribers feedback on the performance of the health monitoring system 3010. The subscriber feedback may then be used by operators of the health monitoring system 3010 to contemplate changes to and make improvements to the health monitoring system 3010.

According to the principles of the invention, a subscriber may enroll in the personal security service by accessing the configuration engine 3040 via a secure Internet connection. The subscriber provides essential medical and demographic information to the configuration engine 3040; the subscriber's health-care providers may also provide various medical information to the configuration engine 3040, also via a secure Internet connection. The medical data provided to the configuration engine by the subscriber is then downloaded to the subscriber's wearable unit 3020 via the global communication network 303.

In operation, the wearable unit 3020 is worn by the subscriber. When the subscriber experiences an emergency event, the subscriber manually presses a button or sequence of buttons on the communication component 3022 of the wearable unit 3020. Of course, if the emergency event is triggered by physiological data and the subscriber is unable to select the button or sequence necessary to initiate communication with the computer system 3040, the wearable unit may automatically initiate communication with the computer system 3040. When an emergency

event has been indicated, the communication component 3022 may then collect global positioning information via the geographical positioning system antenna 3230 and the geographical positioning system device; these data may be stored in a memory located in the communication component 3022. At about the same time, the communication component 3022 may collect data physiological data from the sensor component 3027 via the short-range transceivers 3022A, 3027A; these data may also be stored in the memory located in the communication component 3022. The memory for storing data in the communication component 3022 serves as a "black box" for the communication component and may be of the same type as memory 430, described above. Once the global positioning information and the physiological data are collected by the communication component 3022, the communication component 3022 may initiate a link with the computer system 3040 via the communication network 3030. As discussed above, this link may be made via a satellite system, a cellular system, or some combination of these or other systems.

Once the communication component 3022 establishes a link with the computer system 3040, the data from the communication component 3022 may be sent to the distress event engine 3100 in the form of the emergency data packet described above. As discussed above, the distress event engine 3100 may carry out several significant steps. The distress event engine 3100 may convert GPS data or data provided by an internal navigation system on the wearable unit 3020 to actual geographic coordinates; these coordinates may then be used to search the database of PSAPs maintained by the distress event engine 3100 in order to determine how to reach the appropriate EMS. The distress event engine 3100 may then generate synthesized speech corresponding to the emergency data packet and corresponding to the official language or an

official language or an official language in the region where the subscriber is located and in order to communicate with the EMS. Once the EMS is contacted and the appropriate information is conveyed to the EMS, the distress event engine 3100 may then notify the subscriber that the emergency event message has been received by the EMS; this notification is preferably made through the wearable unit 3020.

During the period when emergency event information is being communicated to and from the computer system 3040 by the wearable unit 3020, the event history system 3090 may store records of these communications. As described above, the event history system 3090 may also page a physician or other health-care professional to notify that person that the subscriber has experienced an emergency event; preferably, the event history system notifies the primary care health-care professional for the subscriber.

In an another alternative embodiment, a communications unit may be enabled with wireless web connectivity, Bluetooth communications capability, and location resolution capability, or any other suitable communicative features. In this case, the application program that collects the user's biometric parameters, initiates distress resolution, stores the user's medical record, and provides other content may reside on a remote, Internet-based computer system and may be downloaded at least once to the communications unit. The application program may include web pages that may be displayed on a viewscreen on the communications unit and that are translated to a wireless web display format from a standard web display format via a wireless application server that resides on a remote Internet site. The application program exchanges data streams with the remote, Internet-based application by interfacing to the host application through the wireless application server.

In a further alternative embodiment to multidimensional reporting, a data mining software application may interface with a biometric data warehouse and data marts. A series of mathematical techniques may be utilized in data mining, such as k-nearest neighbor, neural networks, and genetic algorithms, and may be encoded in the data mining application as an analysis script for on-demand or schedule-driven activation. When activated, the analysis script(s) analyze the data in the data warehouse and/or data marts. The analyses may be used by healthcare industry companies to accelerate clinical trials for new drugs, medical treatments, and/or medical devices and/or to identify the most effective courses of medical treatment for particular classes of chronic disease. The analyses may also be used by recreational, amateur, or professional athletes to evaluate performance as recorded by the overall system. The analyses may be further used by expectant mothers to evaluate their health and the health of their unborn child. The data mining application may be accessible via the Internet. A fee-for-usage or result-generated system may be encoded in software that locks and unlocks access for users to the data mining application. Such data mining applications may reside on a remote Internet computer system and may be Internet accessible.

It is to be understood that the scope of the invention presented herein contemplates any combination of elements from the various embodiments disclosed herein.

What is claimed is:

1. An apparatus for providing personal security to an individual comprising:

an event sensor;

a manual event signaling system;

a message generation system, said message generation system connected to said event sensor and said manual event signaling system, said message generation system generating an emergency message; and

a data transmission system, wherein said data transmission system communicates said emergency message to a remote processing system via a communications protocol.

2. The apparatus of claim 1, further comprising a positioning system.

3. The apparatus of claim 2, wherein said message generation system is further connected to said positioning system, and said emergency message comprises positioning information.

4. The apparatus of claim 1, further comprising a memory for storing user data, wherein said user data are collected from said event sensor.

5. The apparatus of claim 1, further comprising a communication system, wherein said communication system communicates said user data to said remote processing system.

6. An apparatus for providing personal security to an individual comprising:

means for sensing an emergency event;

means for manually signaling an emergency event;

means for generating an emergency message based on said emergency event; and

means for transmitting said emergency message to a remote processing system via a communications protocol.

7. The apparatus of claim 6, further comprising positioning means for detecting a geographic location of said emergency event sensing means.

8. The apparatus of claim 7, wherein said generating means further generates said emergency message including said geographic location, and said emergency message comprises positioning information.

9. The apparatus of claim 8, further comprising means for storing user data, wherein said user data are collected from said sensing means.

10. The apparatus of claim 9, further comprising means for communicating said user data to said remote processing system.

11. The apparatus of claim 1, further comprising a remote, Internet-based computer system.

12. The apparatus of claim 11, wherein said computer system maps a geographic location to a specific local language.

13. The apparatus of claim 11, said computer system further comprising a database of telephone numbers for local emergency response centers for all regions of Earth.

14. The apparatus of claim 13, further comprising a connection system for contacting a local emergency number for a geographic location of said event sensor.

15. The apparatus of claim 14, further comprising a communication system for to direct said emergency message to a local emergency response center using synthesized voice communications.

16. The apparatus of claim 15, further comprising a computerized dispatch system, wherein said communication system directs said emergency message to said computerized dispatch system in said local emergency response center using a computerized message format.

17. A method of providing personal security to an individual comprising:

sensing an emergency event;

generating an emergency message, said emergency message based on said emergency event; and

transmitting said emergency message to a remote processing system.

18. The method of claim 17, further comprising determining a geographic location of said emergency event.

19. The method of claim 18, wherein said emergency message further includes said geographic location.

20. The method of claim 19, further comprising storing user data.

21. The method of claim 20, further comprising communicating said user data to said remote processing system.

22. A method of providing personal security to an individual comprising the steps of:

sensing an emergency event;

generating an emergency message, said emergency message based on said emergency event; and

transmitting said emergency message to remote processing system.

23. The method of claim 22, further comprising the step of determining a geographic location of said emergency event.

24. The method of claim 23, wherein said emergency message further includes said geographic location.

25. The method of claim 24, further comprising the step of storing user data, wherein said user data is collected in said sensing step.

26. The method of claim 25, further comprising the step of communicating said user data to said remote processing system.

27. The apparatus of claim 1, wherein said event sensor is remotely located from said message generation system and said data transmission system.

28. The apparatus of claim 27, further comprising a first radio transceiver and a second radio transceiver, wherein said first radio transceiver is connected to said event sensor and said second radio transceiver is connected to said message generation system, and further wherein said first radio transceiver communicates with said second radio transceiver.

29. An apparatus for providing personal health monitoring to an individual comprising:

an event sensor;

a message generation system, said message generation system connected to said event sensor, said message generation system generating a periodic data message; and

a data transmission system, wherein said data transmission system periodically communicates said periodic data message to a remote processing system via a communications protocol.

30. The apparatus of claim 29, said event sensor further comprising a medical sensor for continuous measurement of biometric physiological parameters.

31. The apparatus of claim 30, further comprising a remote, Internet-based computer system.

32. In a system for providing personal security to an individual, a computer-readable memory for storing data for access by an application program comprising:

a data structure stored in said computer-readable memory, said data structure including information used by said application program and including:

a receiving field for collecting biometric data;

a storing field for retaining said biometric data;

an analyzing field for processing said biometric data; and

a displaying field for exhibiting said biometric data.

33. The apparatus of claim 31, said computer system further comprising a computer-readable memory for storing data for access by an application program comprising:

a data structure stored in said computer-readable memory, said data structure including information used by said application program and including:

a receiving field for collecting biometric data from said data message;

a storing field for retaining said biometric data;

an analyzing field for processing said biometric data; and

a displaying field for exhibiting said biometric data.

34. The data structure of said computer-readable memory of claim 33, further comprising a priority notification field for communicating notice to a healthcare provider.

35. The apparatus of claim 31, wherein said computer system is connected to a notice generation system.

36. The apparatus of claim 34, wherein said computer system is connected to a notice generation system.

37. The apparatus of claim 35, wherein said notice generation system communicates with a healthcare provider.

38. The apparatus of claim 36, wherein said notice generation system communicates with a healthcare provider.

39. The apparatus of claim 37, wherein said notice generation system communicates with said healthcare provider via at least one of a plurality of links, wherein said at least one of a plurality of links comprises paging, email, facsimile, automated phone calling, screen pops, and remote software agents.

40. The apparatus of claim 38, wherein said notice generation system communicates with said healthcare provider via at least one of a plurality of links, wherein said at least one of a plurality of links comprises paging, email, facsimile, automated phone calling, screen pops, and remote software agents.

41. A method for providing personal health monitoring to an individual comprising:

continuously measuring biometric physiological parameters;

periodically generating data messages; and

transmitting said data messages to a remote Internet-based computer system.

42. The method of claim 41, further comprising storing said data messages in said remote Internet-based computer system.

43. The method of claim 41, further comprising storing a user-specific threshold and a rule for biometric data processing.

44. The method of claim 43, further comprising applying said rule to said data messages.

45. The method of claim 44, further comprising generating priority alerting media for a healthcare provider.

46. The method of claim 45, further comprising generating threshold-based priority alerts to said healthcare provider via said rule.

47. The method of claim 42, further comprising transmitting said data messages to a healthcare provider.

48. The method of claim 47, further comprising displaying and analyzing said data messages by said healthcare provider.

49. A method of providing feedback to a device worn by an individual comprising:

entering a feedback message by a healthcare provider;

transmitting said feedback message to a remote computer system;

transmitting said feedback message from said remote computer system the device.

50. An apparatus for providing business-to-business biometric data reporting comprising:

a data warehouse for storing discrete biometric parameter measurements;

at least one software script for extracting said biometric parameter measurements from a wearable device and storing said biometric parameter measurements into said data warehouse;

at least one multi-dimensional data mart;

a processing system to aggregate biometric parameter measurements stored in said data warehouse and to transfer said aggregated biometric parameter measurements to said data marts;

an analysis system to generate a report from said biometric parameter measurements in said data warehouse or said aggregated biometric parameter measurements in said data marts; and

a security system to identify requesting parties and to control access to said biometric parameter measurements, said aggregated biometric parameter measurements, and an Internet site.

51. The apparatus of claim 50, wherein said analysis system further comprises a scheduling system, wherein said scheduling system provides a schedule-based or an on-demand retrieval of said report or a data stream from said Internet site.

52. The apparatus of claim 51, further comprising a payments transaction system to charge a business for access to said report.

53. The apparatus of claim 52, further comprising an interface definition system to enable a translation of said reports or said data stream from a native format to a target business's format.

54. The apparatus of claim 50, wherein said processing system further comprises Internet-enabled software tools for definition and selection of at least one custom aggregation by a healthcare business.

55. A method of providing business-to-business biometric data reporting comprising:

storing discrete biometric parameter measurements in a data warehouse;

filling of said data warehouse with software scripts that extract the biometric data parameter measurements from other sources;

using aggregated data marts of multi-dimensional data;

supplying said data marts using a software system for accessing said multi-dimensional data;

using a software system to generate a report from information in said biometric parameter measurements in said data warehouse or said multi-dimensional data in said data marts; and

using a security system for identifying a requesting party and for controlling access to said biometric parameter measurements and an Internet site.

56. The method of claim 55, further comprising delivering said report based on a retrieval demand or a predefined schedule.

57. The method of claim 56, further comprising recording a payment transaction in exchange for access to said report.

58. The method of claim 57, further comprising defining an interface enabling translation of said report or a data stream from a native format to a target format.

59. The method of claim 56, wherein said report is a result of an aggregation defined and selected by a healthcare business.

60. An apparatus comprising a computer program for remote biometric data collection and personal security in communication with a remote wireless communications unit.

61. The apparatus of claim 60, further comprising a wireless network, wherein said computer program is automatically downloaded via said wireless network to said remote wireless communications unit upon demand from said remote wireless communications unit.

62. The apparatus of claim 60, further comprising a wireless network, wherein said computer program is downloaded via said wireless network to said remote wireless communications unit upon request from said remote wireless communications unit.

63. The apparatus of claim 60, wherein said computer program is permanently stored on said remote wireless communications unit.

64. The apparatus of claim 60, wherein said computer program is temporarily stored on said remote wireless communications unit.

65. A method of distributing a computer program for remote biometric data collection and personal security to a variety of types of independent wireless communications devices comprising downloading the computer program via a wireless network to the independent wireless communications devices.

66. The method of claim 65, further comprising managing the downloading of the computer program with a wireless application server that interfaces with both a wireless communications device and an Internet-based application server program.

67. A method of mining biometric data comprising applying mathematical techniques to identify, predict, and analyze results and trends in human physiology, wherein the mathematical techniques are embodied in software.

68. The method of claim 67, wherein applying the mathematical techniques comprises employment of k-nearest neighbors.

69. The method of claim 67, wherein applying the mathematical techniques comprises employment of neural networks.

70. The method of claim 67, wherein applying the mathematical techniques comprises employment of genetic algorithms.

71. The method of claim 67, wherein the results and trends comprise effectiveness, dosage, formulary, prescriptive frequency, and period of prescription for pharmaceuticals.

72. The method of claim 67, wherein the results and trends comprise effectiveness, type, and nature of a non-pharmacological course of medical treatment.

73. The method of claim 67, wherein the results and trends comprise evaluation of athletic performance.

74. The method of claim 67, wherein the results and trends comprise evaluation of fetal health.

75. The method of claim 67, further comprising charging payment to pharmaceutical companies, managed care organizations, physician's practice management groups, or physicians, wherein the results and trends are utilized to accelerate clinical trials, or select and prescribe appropriate medical treatments for patients.

76. The method of claim 67, further comprising charging payment to athletes, wherein the results and trends are utilized to evaluate performance of the athletes.

77. The method of claim 67, further comprising charging payment to expectant mothers, wherein the results and trends are utilized to evaluate health of the expectant mothers and health of unborn children of the expectant mothers.

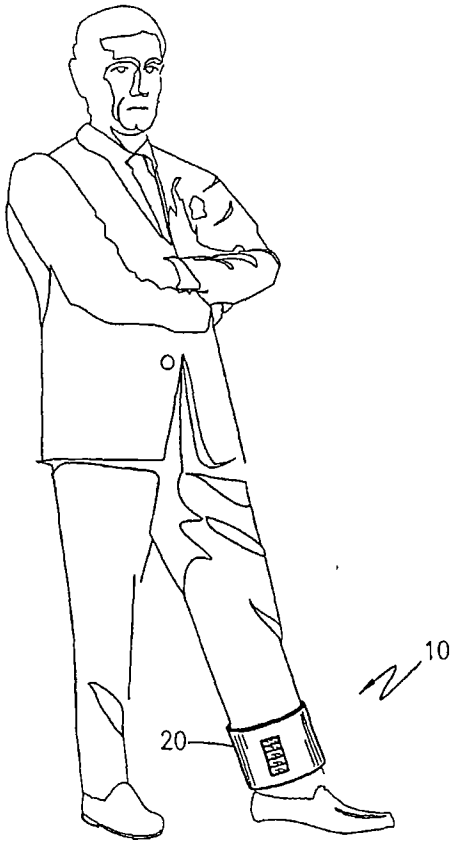


Figure 1

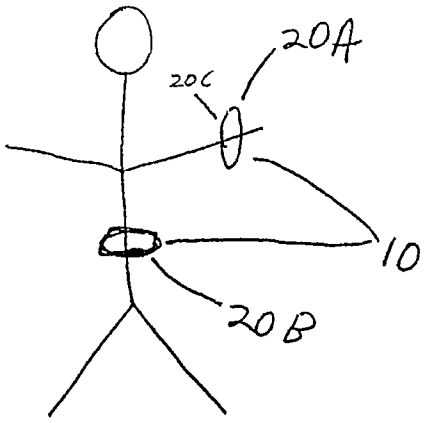


Figure 1A

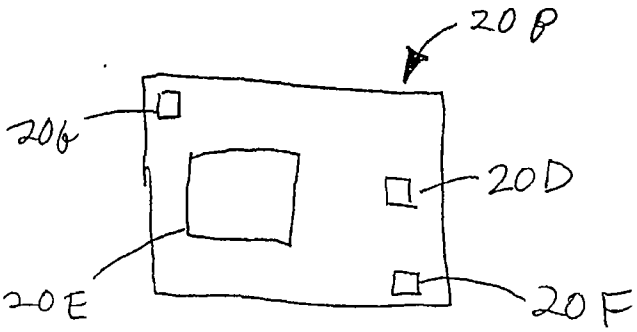


Figure 1B

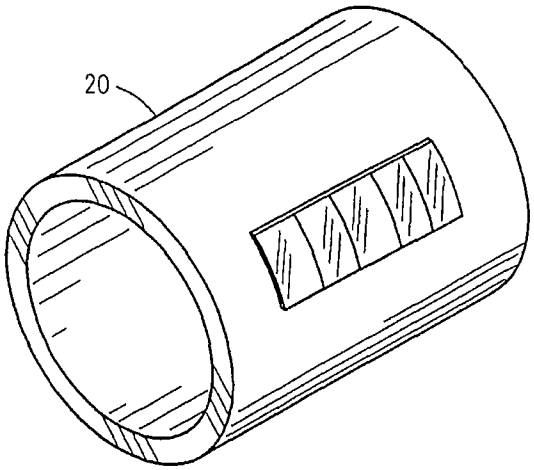


Figure 2a

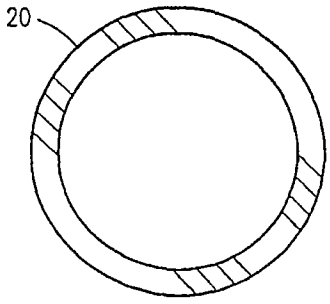
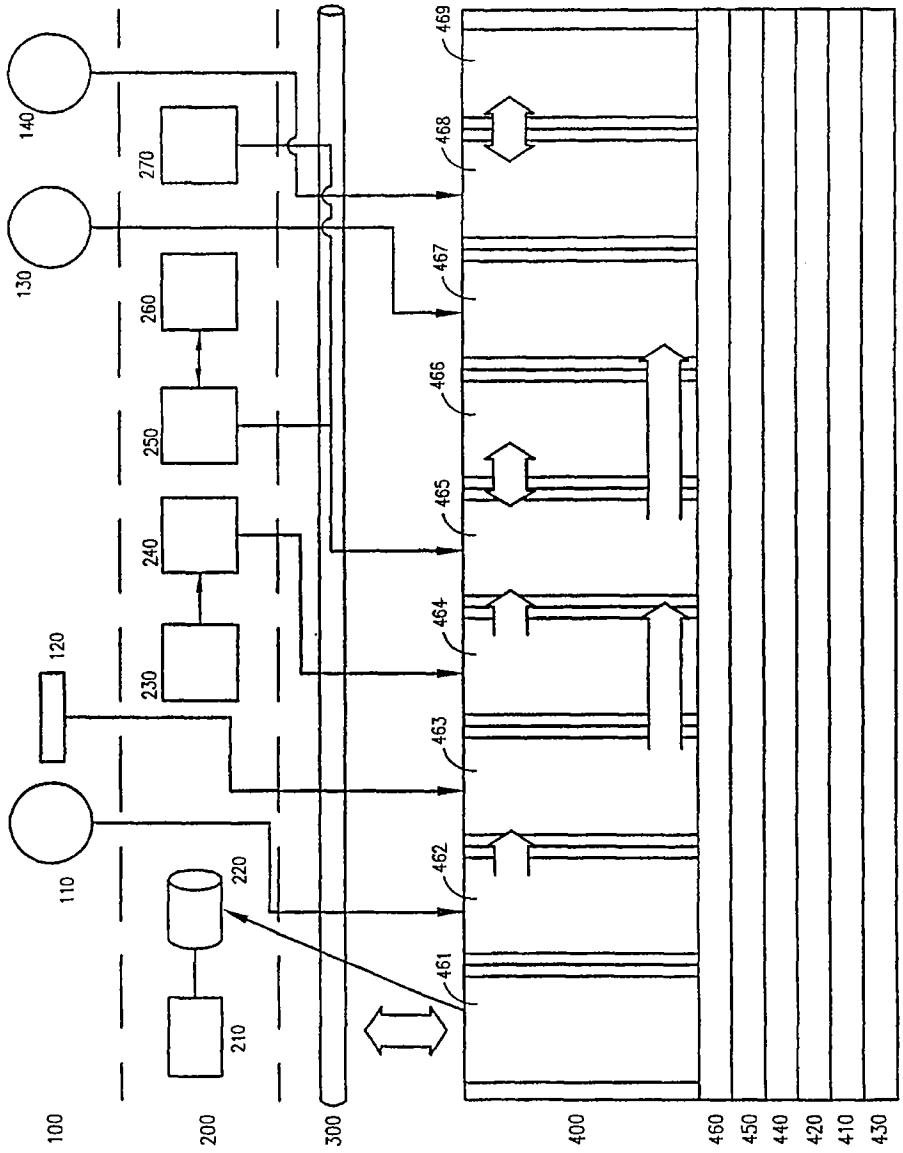


Figure 2b


140
130
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250
240
230
220
210
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464
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200
300
400
460
450
440
420
410
430

Figure 3

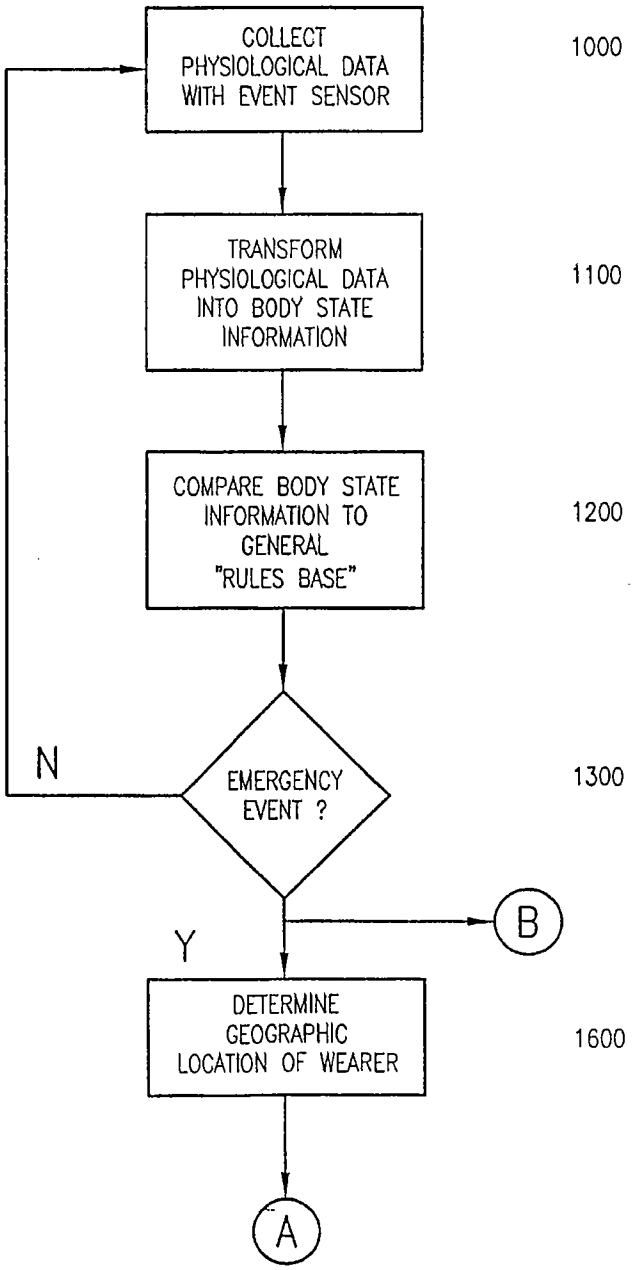
COLLECT PHYSIOLOGICAL DATA WITH EVENT SENSOR
1000
TRANSFORM PHYSIOLOGICAL DATA INTO BODY STATE INFORMATION
1100
COMPARE BODY STATE INFORMATION TO GENERAL "RULES BASE"
1200
EMERGENCY EVENT ?
1300
N
Y
B
DETERMINE GEOGRAPHIC LOCATION OF WEARER
1600
A

Figure 4a

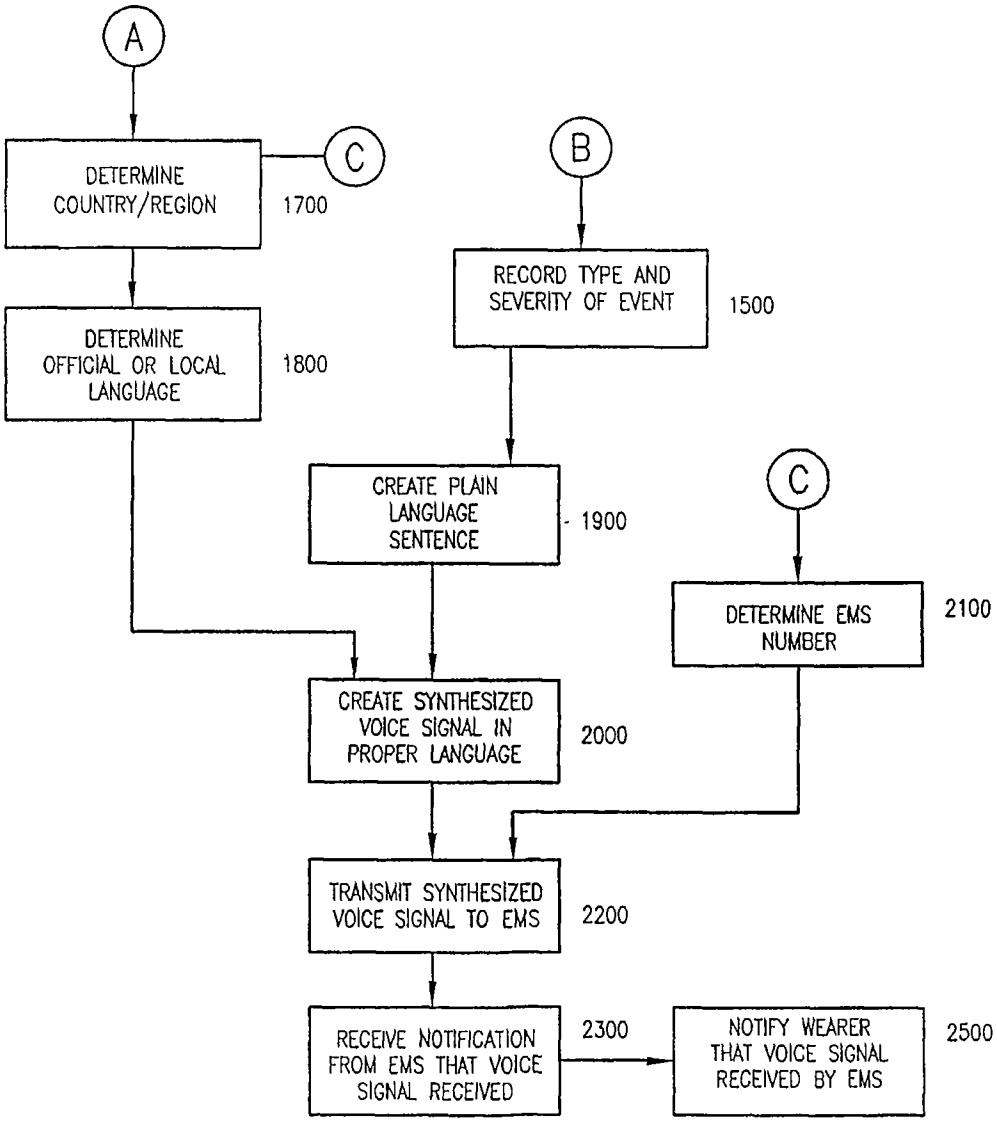
A
DETERMINE COUNTRY/REGION
C
1700
B
RECORD TYPE AND SEVERITY OF EVENT
1500
DETERMINE OFFICIAL OR LOCAL LANGUAGE
1800
CREATE PLAIN LANGUAGE SENTENCE
1900
C
DETERMINE EMS NUMBER
2100
CREATE SYNTHESIZED VOICE SIGNAL IN PROPER LANGUAGE
2000
TRANSMIT SYNTHESIZED VOICE SIGNAL TO EMS
2200
RECEIVE NOTIFICATION FROM EMS THAT VOICE SIGNAL RECEIVED
2300
NOTIFY WEARER THAT VOICE SIGNAL RECEIVED BY EMS
2500

Figure 4b

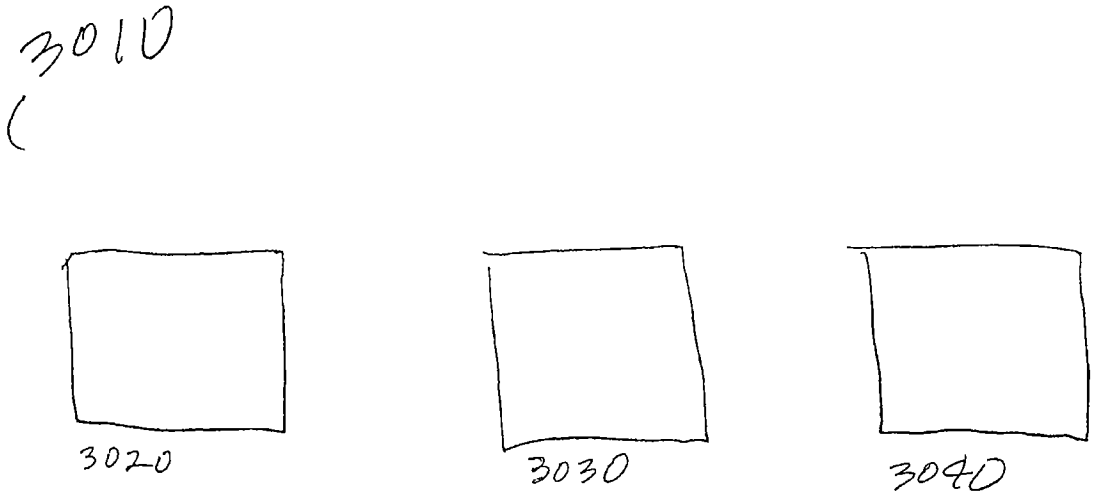

Figure 5

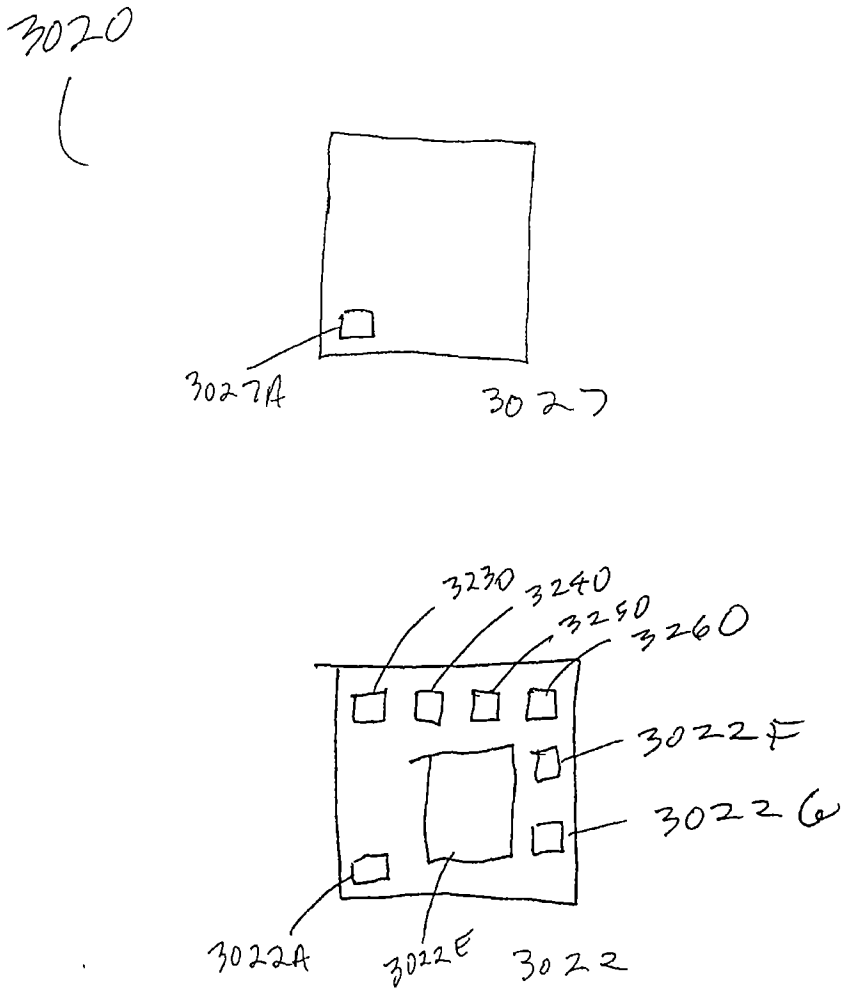
3020
3027A
3027
3230
3240
3250
3260
3022F
3022G
3022A
3022E
3022

Figure 6

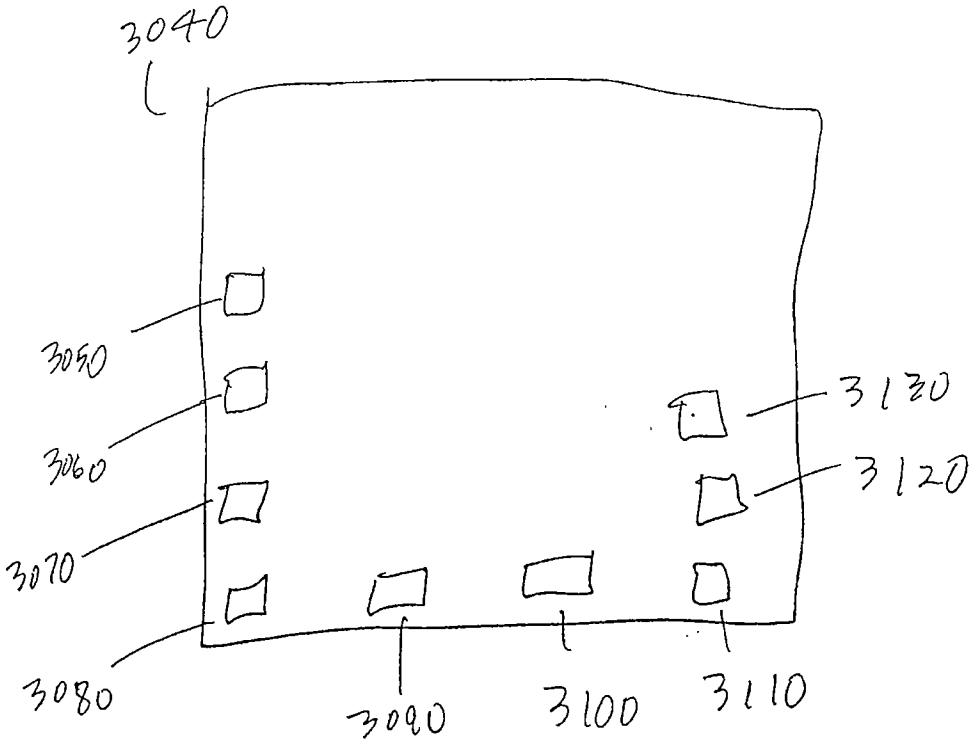

Figure 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/29715

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :G06F 17/60
US CL : 705/2

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 705/2, 3; 600/300; 340/825.36

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EAST (JPO,EPO, Derwent, US Patents), PROQUEST (all databases)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y --- A	US 5,825,283 A (CAMHI) 20 October 1998, see Fig. 2, Fig. 3, col. 16, line 44 - col. 17, line 35, line 64 - col. 18, line 10 and lines 18-39.	1-30, 32-34, 41-48, 55 and 65 ---- 31, 35-40, 49-54, 56-64, and 66-77
Y --- A	US 5,808,564 A (SIMMS et al) 15 September 1998, Fig. 1, col. 4, line 50 - col. 5, line 5, and col. 6, lines 12-20.	1-30, 32-34, 41-48, 55 and 65 -------- 31, 35-40, 49-54, 56-64, and 66-77

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 28 DECEMBER 2001	Date of mailing of the international search report 16 JAN 2002
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer TARIQ HAFIZ James R. Matthews Telephone No. (703) 305-7043

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/29715

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,742,233 A (HOFFMAN et al) 21 April 1998, see abstract.	1-77
A	US 5,745,037 A (GUTHRIE et al) 28 April 1998, see abstract.	1-77
A	US 5,832,448 A (BROWN) 03 November 1998, see abtract.	1-77
A	POTTIE et al. Wireless integrated network sensors. Association for Computing Machinery. Communications of the ACM. May 2000. Vol. 43. No. 5. pages 51-58.	1-77
A	ANONYMOUS. Motorola's CreataLink 2XT Two-Way Data Transceiver Now Available for Additional Reflex Systems. Business Wire. 22 August 2000. No. 334418.	1-77